

REMARKS

Claims 1-43 were previously pending in the present application. Reconsideration of the present application in light of the following remarks is respectfully requested.

Objection to the Specification

The Examiner objected to the Specification because of informalities. More specifically, the Examiner indicated that the first paragraph of page 4 of the Specification was incomplete. Accordingly, paragraph [0010] has been amended and is now complete. Thus, the objection to the Specification should be withdrawn.

Double Patenting Rejection

Claims 1-3 and 22-25 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-3 and 8-10 of U.S. Patent 6,642,117 issued to Chen et al. Applicant has submitted herewith a terminal disclaimer under 37 C.F.R. § 1.321, thus obviating the double patenting rejection. Applicant respectfully requests that the double patenting rejection be withdrawn.

Rejections under 35 U.S.C. § 102

Claims 1 and 23 were rejected under 35 U.S.C. §102(b) as being anticipated by Raaijmakers et al. (U.S. Patent 6,348,420 hereinafter referred to as “Raaijmakers”). This rejection is respectfully traversed, for the following reasons.

The PTO provides in MPEP § 2131 that

“[t]o anticipate a claim, the reference must teach every element of the claim....”

Thus, with respect to claims 1 and 23, to sustain this rejection the Raaijmakers reference must contain *all of the above claimed elements* of the claim. However, it is respectfully submitted that Raaijmakers does not teach “subjecting the initial stacked gate dielectric to a

plasma nitridation process under an N-containing ambient to form an intermediate stacked gate dielectric,” as is recited in claims 1 and 23.

The Examiner indicated that this feature is allegedly disclosed in Column 15, lines 21-37 of Raaijmakers. (Office Action, pg. 2). Applicant respectfully disagrees. The cited passage of Raaijmakers recites the following:

Following formation of 520, 530 of the dielectric stack, an in situ anneal 535 serves to [densify] the silicon nitride layer. In the illustrated embodiment, silane flow is stopped while nitrogen and ammonia flow are maintained at the same flow rate as during nitride deposition. Preferably after silane is fully purged from the chamber, wafer temperature is ramped from 780° C. to about 900° C. (consuming about 10 seconds for the preferred reactor) and the anneal 535 maintained for about 60 seconds. Advantageously, the wafer is unloaded 540 while the reactor continues to idle at about 900° C., such that, upon unloading the old and loading a new wafer, the new wafer quickly reaches temperature stability. In other arrangements, however, an oxidant (e.g., N₂O, NO, O₂ or O radicals) is instead provided during the anneal 535. In still other arrangements, the anneal 535 includes exposure to a nitriding agent (e.g., NH₃, N₂ or N radicals) followed by exposure to an oxidant.

From the above, it is clear the cited passage is wholly silent as to the feature of “subjecting the initial stacked gate dielectric to a plasma nitridation process under an N-containing ambient.” In contrast, Raaijmakers discloses that an anneal process is performed on the dielectric stack at a temperature of about 900 ° C. However, the Examiner takes the position that “[a] remote plasma generator is located upstream from the reaction chamber...allowing for said plasma nitridation/oxidation processes.” Applicant respectfully disagrees. The Raaijmakers reference discloses a remote plasma generator but not in the context of a plasma nitridation process being performed on the initial dielectric stack. For example, Raaijmakers discloses that the remote plasma generator is used for plasma cleaning of the wafer, plasma enhanced growth of interfacial dielectric, and plasma enhanced or assisted dielectric deposition. (See Raaijmakers, Fig. 10).

Accordingly, the Raaijmakers reference does not disclose each and every limitation of claims 1 and 23. Therefore, the rejection of claims 1 and 23 under 35 U.S.C. §102 is not supported by the Raaijmakers reference and should be withdrawn.

Dependent Claims

Claims 2-21 and 24-43 depend from, either directly or indirectly, and further limit independent claims 1 and 23, respectively, and thus are in condition for allowance for at least the same reasons as set forth above in claims 1 and 23.

Further, regarding claims 12-15 and 34-37, the Examiner indicated that “Raaijmakers teaches a method of forming ultra thin dielectric stacks of high quality where the plasma nitridation process is conducted at a temperature range of 650-680 °C in a reaction chamber set within a range of 1-80 torr (col. 20, lines 34-36; col. 19, lines 22-26).” (Office Action, pg. 3). However, the cited passages of Raaijmakers disclose these conditions in the context of a plasma assisted dielectric deposition process (col. 20, lines 34-36) and a polysilicon deposition process (col. 19, lines 22-24). Thus, Raaijmakers does not disclose these conditions in the context of a plasma nitridation process being performed on the initial dielectric stack, as is recited in claims 12-15 and 34-37.

Rejections under 35 U.S.C. § 103

Claim 3 and 25 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Raaijmakers in view of Bloom et al. (US Patent 6,228,779 hereinafter referred to as “Bloom”). Applicant traverses this rejection on the grounds that the Raaijamkers reference is defective in maintaining a *prima facie* case of obviousness with respect to claims 1 and 23, from which claims 3 and 25 depend from, respectively.

As the PTO recognizes in MPEP § 2142:

... *The examiner bears the initial burden of factually supporting any prima facie conclusion of obviousness. If the examiner does*

not produce a prima facie case, the applicant is under no obligation to submit evidence of nonobviousness...

It is submitted that, in the present case, the examiner has not factually supported a *prima facie* case of obviousness for the following reasons. Raaijmakers cannot be applied to reject claims 1 and 23 under 35 U.S.C. § 103(a) which provides that:

A patent may not be obtained ... if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains ... (Emphasis added)

Thus, when evaluating a claim for determining obviousness, all limitations of the claim must be considered. However, the Raaijmakers reference does not disclose or suggest, all the claim limitations of claims 1 and 23 as was discussed above.

Accordingly, the Examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection to claims 3 and 25 under 35 U.S.C. §103(a) should be withdrawn.

Further, claims 16-19 and 38-41 were rejected under 35 U.S.C. §103(a) as being unpatentable over Raaijmakers. The Examiner indicated that "Raaijmakers teaches a process for forming ultra thin dielectric stacks of high quality aided by plasma energy with an optional anneal step using nitriding and oxidizing agents (i.e. reoxidation step)." (Office Action, pg. 5). However, Raaijmakers is wholly silent as to performing a plasma reoxidation process on the intermediate stacked gate dielectric, as is recited in claims 16-19 and 38-41. As previously discussed, Raaijmakers discloses that the remote plasma generator is used for plasma cleaning of the wafer, plasma enhanced growth of interfacial dielectric, and plasma enhanced or assisted dielectric deposition. (See Raaijmakers, Fig. 10).

Accordingly, the Examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection to claims 16-19 and 38-41 under 35 U.S.C. §103(a) should be withdrawn.

Conclusion

All matters set forth in the Office Action have been addressed. Accordingly, it is believed that all claims are in condition for allowance. Favorable consideration and an early indication of allowability are respectfully requested.

Should the Examiner deem that an interview with Applicant's undersigned attorney would expedite consideration, the Examiner is invited to call the undersigned attorney at the telephone number indicated below.

Respectfully submitted,



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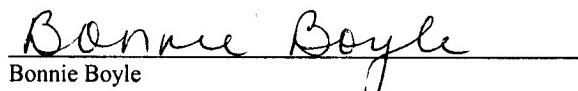
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